REPORT RESUMES

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DIFFERENTIAL COSTS OF CURRICULA IN COMPREHENSIVE JUNIOR COLLEGES.

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DESCRIPTORS- *JUNIOR COLLEGES, *COSTS, *STUDENT COSTS, *PROGRAM COSTS, SCHOOL FUNDS, EDUCATIONAL FINANCE, EXPENDITURES,

TO DETERMINE RELATIONSHIPS AMONG COSTS OF SPECIALIZED VOCATIONAL-TECHNICAL CURRICULA AND GENERAL OR LIBERAL ARTS CURRICULA, PROGRAMS AT EIGHT PUBLIC JUNIOR COLLEGES WERE ANALYZED, AND THE TOTAL COSTS OF EDUCATING A STUDENT IN EACH CURRICULUM WERE COMPUTED. SEVEN CONCLUSIONS ARE OFFERED--1) MOST OCCUPATIONAL AND TECHNICAL CURRICULA COST MORE PER STUDENT THAN LIBERAL ARTS AND TRANSFER CURRICULA IN THE SAME INSTITUTION, 2) ENGINEERING TECHNOLOGY PROGRAMS ARE ABOUT TWICE AS EXPENSIVE AS LIBERAL ARTS AND TRANSFER PROGRAMS, 3) INDUSTRIAL AND MEDICAL TECHNOLOGY PROGRAMS ARE ABOUT 1.5 TIMES AS EXPENSIVE AS LIBERAL ARTS, 4) PER STUDENT COSTS IN HOME ECONOMICS AND DIETETICS ARE ABOUT 1.2 TIMES THOSE IN LIBERAL ARTS, 5) LIBERAL ARTS PROGRAMS TEND TO COST SLIGHTLY MORE THAN DO THOSE PREPARING STUDENTS FOR BUSINESS, OFFICE, AND PUBLIC SERVICE OCCUPATIONS, 6) ON A STUDENT CREDIT HOUR BASIS, COSTS IN VOCATIONAL CURRICULA EXCEED THOSE IN GENERAL ACADEMIC PROGRAMS--IN SOME CASES BY AS MUCH AS 300 PERCENT, AND 7) THE HIGHER COSTS OF VOCATIONAL-TECHNICAL PROGRAMS SEEM TO BE THE RESULT OF SMALL ENROLLMENTS IN COMBINATION WITH LARGE NUMBERS OF CLASS CONTACT HOURS. (AD)

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By

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Ernest F. Anderson

The study reported herein was conducted at the University of Illinois under the direction of Dr. William P. McLure, Director, Bureau of Educational Research, University of Illinois, and was pursuant to a contract with the Research Coordinating Unit, Illinois Board of Vocational Education and Rehabilitation, upon approval by Vernon E. Bergener, Coordinator of Research, and John A. Beaumont, Director, Vocational and Technical Education.

1966

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CHAPTER I

INTRODUCTION

One of the problems facing this nation is how to provide adequate financial support for the increasing enrollments in higher education (6). The problem is especially acute for junior colleges in most states because of the emerging nature of these institutions and the trend toward comprehensive programs. Many state governments are continuing to provide increased financial support to local junior colleges and to increase the level of support for state junior colleges as a greater proportion of students in higher education enroll in these institution (4). The amount of local support continues to increase as technical and part time adult programs are developed as a part of the junior college curriculum.

The current trend in junior college organizational structure is toward comprehensive type institutions with an increasing proportion of their financial support coming from state funds. Some of the large comprehensive junior colleges offer as many as 500 different courses distributed among 40 or more curricula, exclusive of college level non-credit adult courses. There is tremendous variation in the unit costs of these courses, resulting in differences in cost for the various educational curricula. Some studies show from experience that technical courses are several times more costly to operate than general courses. The technical courses have extensive outlays of laboratories and teaching equipment while the general courses require less expensive materials and a lower ratio of instructional time per student. A study (5) of California junior colleges in 1963 reports a teaching salary cost per credit hour of $41.69 for courses in Registered Nursing, $38.30 for Business Equipment Technology, $35.86 for Chemical Technology, $31.42 for Shoe Building, $14.40 for Dental Technology and $14.33 for Aeronautical Technology. The average teaching salary cost per student credit hour was $5.89 for courses in Social Science; $9.63 for Humanities; and $11.48 for Mathematics, Physical Science, and Engineering courses. The total cost per student credit hour was not reported, but it would be likely to increase the differential between the cost of general and specialized technical courses.

As the need for new and expanded junior colleges continues to grow, the importance of basic financial knowledge about the differential cost of various educational curricula to be offered becomes more crucial than in the past when these institutions were supported for the most part by local school systems. Not only is there a rapid increase in the number of junior college students enrolling in two-year transfer curricula which lead toward a baccalaureate degree at some four year college or university, but there is a growing public demand to improve the quality of current programs and establish many new curricula in the areas of vocational and technical education for both college age youth and adults. This means that the total financial support for higher education at the junior college level must not only be expanded to accommodate the increase in number of students and ensure the necessary "mix" of curricula but also to rely more heavily on allocated funds. When a state embarks on the development of a state-wide system of junior colleges, basic knowledge about the variable costs of curricula will be required to plan intelligently for the approval of programs and to project financial costs for state-wide policy making.

Statement of the Problem

Educational curricula and programs vary tremendously in cost, particularly in reference to the number of students served. There is a lack of adequate knowledge about the cost of various combinations of courses and curricula which make up the total program of a complex institution. All curricula have a basic component of course work that may be defined as liberal arts or general education. These are courses taken by students in all or almost all of the curricula of the college. The occupational curricula designed for preparation of vocational and technical specialists have components of specialized work commonly referred to as "vocational" or "technical" courses in addition to the basic component of liberal arts. Some specialized technical curricula may have as much as 75 percent of the two-year program made up of the specialized courses and only 25 percent liberal arts components. Curricula which culminate in law, medicine, teaching, and other professions requiring four or more years of college consist almost entirely of liberal arts at the junior college level.

The unit cost of providing the first two years of a curriculum in a liberal arts college is far different from the unit cost in a large comprehensive institution which offers a curriculum in liberal arts and provides the liberal arts component as well as the specialized courses for all of the vocational and technical curricula offered. In some very large junior colleges there are as many as 40 specialized curricula designed to prepare graduates for immediate employment upon completion of the curriculum. The cost of specialized components of vocational and technical curricula in comprehensive institutions will necessarily be higher than the liberal arts components because of the small student-staff ratio in shops and laboratories and the greater quantity of facilities and instructional materials utilized per student. This means that it is going to cost more to provide the specialized vocational and technical curricula than it costs to provide the liberal arts curricula designed for transfer. These differences in cost between the general and the specialized curricula raise fundamental questions in the planning, development and operation of a state system of comprehensive junior colleges.

Given the present method of financing junior colleges the course mix, proportion of general to special courses, in a curriculum and the curricula mix, proportion of general to vocational and technical curricula, in the total program are very important considerations for junior colleges. The mix of courses and curricula is important because local funds usually have to be used to pick up the extra costs for the specialized vocational and technical curricula. As we move more and more to state financing of junior colleges there should be less concern on the local level about the "extra" costs of special curricula because the state will be supporting more of these extra costs.

During the development and growth of institutions officials make choices about which curricula to offer and which ones not to provide. When state policy permits, there seems to be a tendency for local boards of control to establish and operate the least expensive curricula rather than the curricula for which the students and society have the greatest need. It is important that an institution have knowledge about the unit costs of courses and curricula so that it can plan for the most economical number of students to admit to a particular curriculum. New curricula which lead toward employment in developing occupations may have to be established and operated at a high unit cost for a few years until enrollments rise to provide a more economical unit cost. Knowledge about the cost of each curriculum is necessary for the development of a rational program for an institution. Perhaps even more important is the contribution this knowledge can make toward development of a state policy to ensure provision of all essential curricula. It can also be used as a basis for consideration of a different public policy supported by a fiscal policy that is congruent with the purposes of the comprehensive junior college.

If a state wants to ensure that curricula in all fields are going to be established and operated, it will be necessary to provide some method of financing the cost differential of the more expensive ones. A number of states such as Florida, New York, Michigan, and Illinois are in the process of developing comprehensive type institutions. Enough generalizable knowledge about the structure of costs for projection of programs is not presently available. This basic financial knowledge is required before a state can plan intelligently the number and location of curricula to provide.

Purpose of the Study

The purpose of this study is to find the relationship of the costs of special vocational and technical curricula of less than four years in length to the costs of general or liberal arts curricula leading to programs of study requiring four or more years of college study. The analysis will ferret out the cost of each course offered in the college. The unit cost of each course included in a curriculum will be aggregated to determine the total cost of educating a student in that curriculum. The cost of each specialized vocational and technical curriculum will be compared to the average cost of educating a student in the liberal arts curricula to see if there is a consistent relationship across the sample institutions included in this study. This empirical analysis of practice in a selected group of institutions will then be used as a basis for preparing a design for analysis that may be applicable for further advancement of knowledge.

Selection of Sample

Eight publicly supported junior colleges were selected from the population of institutions which met the following criteria in 1964-65: (1) continuous operation as a separate junior college for a minimum of five years, (2) a comprehensive program consisting of the common academic-type curricula found in a majority of the two-year liberal arts colleges and at least ten specialized vocational and technical curricula of at least one academic year and less than four years in length, (3) a minimum of 2,000 full-time-equivalent students, and (4) high quality programs. Determination of the population of institutions which meet these criteria was based on the statistical and descriptive data in the 1966 *Junior College Directory* (1), *American Junior Colleges* (7), and *Opening (fall) in Higher Education*, 1964 (22).

It was decided by the investigator that two schools each from California, Florida, Michigan, and New York would provide the most representative sample of institutions which could feasibly be visited and studied within the limitations of this study. A panel of junior college specialists from each of four states was selected and asked to list in rank order four schools which met the four criteria listed above. Nominated schools were contacted in the order listed and asked to participate in the study. The names and addresses of the sample institutions are listed in Appendix A.

Procedures

This study differs from others especially in its design to show the relative cost of special vocational and technical curricula to the cost of general curricula by cumulating the unit cost of each course included in a curriculum to determine the total cost of educating a student in that curriculum. Previous studies (5, 8) have reported the direct salary cost and the total teaching cost per student credit hour for general courses and the average cost per student credit hour for specialized vocational and technical courses. Several studies and statistical reports (3, 15, 21) show the overall average annual expenditure per student in separate institutions, but the writer has been unable to find any research which has been conducted that reports the cost of educating students in a specific curriculum such as chemical technology contrasted with the cost of educating students in the liberal arts curriculum at the same institutions under conditions which might be generalizable to institutions which are projecting plans for development. Previous studies fail to demonstrate the actual cost differential between types of curricula because they fail to take into consideration the differences in course "mix."

The curriculum is a functional module of analysis which can be used to determine how much it costs to provide a student with a given set of experiences. It has a dimension of time as well as specified component parts. If it is desirable to change the experiences in a curriculum, this analysis provides a basis for projecting the cost of a curriculum under a new course mix. A course is the smallest module of analysis which is used to determine the cost of a curriculum, but the curriculum level is the place that courses begin to fit into a design and show the relationship between fields as they appear to fulfill the major function of the institution. The curriculum is the operational level where it is possible to effect the integration of knowledge.

This study attempts to determine the cost of educating a student in a specified curriculum and then utilize these data to demonstrate the relationship of the costs of special vocational and technical curricula to the costs of liberal arts and transfer curricula.

General Design

Step 1. Identification of the population of institutions which meet the minimum criteria for inclusion in the study.

Step 2. Selection of a sample of eight institutions from this population based on the recommendations of persons knowledgeable about junior colleges in their respective states.

Step 3. Contacts with each sample institution to make arrangements to conduct the study.

Step 4. Visits to each institution to gather the following data:

A. Name, position, and salary of each professional staff member.

B. A class schedule for each semester, quarter, or teaching period for the 1964-65 school year.

The schedule is to be supplemented as necessary to provide the name and number of each section of each course taught, credit and contact hours for each course, enrollment, and name of instructor.

C. A college catalog or other document which contains a description of each course and curriculum offered.

D. A copy of the financial report of the fiscal period covered with all expenditures for current operation allocated to academic department insofar as records are available.

E. The number of full-time and part-time students enrolled in each curriculum for the period covered.

Step 5. Analysis of the data to determine:

A. Direct salary cost per student credit hour for each course.

B. Supportive teaching cost per student credit hour for each course.

C. Total cost per student credit hour for each course.

D. Total cost of educating a student in each curricula offered.

E. The average cost of educating a student in the liberal arts and transfer curricula.

F. The average cost of educating a student in each of eight categories of vocational and technical curricula.

Step 6. Calculation of the ratio of the unit costs for the various types of specialized vocational and technical curricula to the unit cost for liberal arts curricula in each sample institution.

Step 7. Calculation of the average ratio of vocational and technical curricula costs to the cost of general curricula for all institutions.

Statistical Analysis

The total cost of educating a student consists of several component parts. The components utilized in this study are administration, salary costs of teachers, supportive instructional costs, operation and maintenance of plant, auxiliary services, fixed charges, and other indirect expenses. All institutional expenses are included except expenditures for original capital outlay and equipment.

The unit cost of each curriculum offered was computed in order to determine the relationship of vocational and technical curricula costs to the costs of liberal arts and transfer curricula in each institution studied. To obtain the unit cost for each curriculum the total expenses of each institution were allocated to the courses taught in order to calculate the unit cost for each course. The cost of educating a student in a curriculum at a given institution during a specified time period is dependent upon the number and type of courses included, the credit hour value of each course, and the cost per credit hour of each course in which the student is enrolled. The unit cost of each course is used to calculate the total cost of educating a student in a specified curriculum.

The first step in computing the unit cost of each course is to allocate the salary of each professional staff member to the courses which he teaches. This is accomplished by the use of Data Form I shown in Appendix B. Salaries of full-time instructors are allocated to classes on the basis of total contact hours. Salaries of staff members devoting only a part of their time to teaching are assigned to teaching in the same proportion as their contact hours related to a full-time teaching load in that department. Their salaries are then allocated to classes in the same manner as full-time salaries. The enrollment and appropriate salary for all sections of a class are transfered to Data Form III shown in Appendix D.

The enrollments and direct salary cost of the several sections of a course taught during the year are summed to arrive at the total enrollment and total direct salary cost for each course offered during the time period covered. The direct salary cost per student credit hour is calculated by dividing the total direct salary cost by the product of the student enrollment in each course and the credit hour value of the course.

Indirect costs for services supportive to instruction are assigned to the basic cost unit which is student credit hour of instruction. Each sample institution provided the data on total expenses by budget category and allocated these expenses to the appropriate instructional department insofar as possible from the financial records maintained by the college. Data Form II illustrated in Appendix C was developed to collect this data, but it proved to be unadaptable to the purpose for which it was designed. A copy of the annual financial report which shows the amount expended in each department for the fiscal period covered proved to be the best method of collecting this data. When available, internal records of the institution were used to allocate the supportive expenses to the instructional department.

The supportive expenses which are not allocated to the instructional departments by the sample institution are distributed to the appropriate department on the basis of the relationship that the direct salary cost of each department bears upon the total direct salary cost of the institution (12). The percentages used for this purpose are shown for one institution in Column 3 of Table 1.

TABLE 1.--Direct Salary Cost, Student Credit Hours, and Unit Costs by Instructional Department, College B, 1964-65

Department (1)	Direct Salary Cost Amount (2)	 Percent of Total (3)	Student Credit Hours (4)	Direct Salary Cost/SCH[1] (5)	Ratio of Total Cost to Direct Salary Cost (6)	Supportive Cost/ SCH[1] (7)	Total Cost/ SCH[1] (8)
Applied Science	$228,491	16.0%	10,972	$20.82	2.13	$23.53	$44.35
Art	49,475	3.5	1,914	25.99	2.30	33.79	59.78
Business	101,021	7.1	6,949	14.54	1.79	11.49	26.03
Language	297,597	20.8	19,975	14.90	1.74	10.63	25.93
Music	37,929	2.7	1,798	21.10	2.07	22.58	43.68
Nursing	123,836	8.7	3,847	32.19	2.21	38.95	71.14
Physical Education	44,321	3.1	2,403	18.44	2.37	25.26	43.70
Retailing	10,948	0.8	888	12.33	2.84	22.69	35.02
Science and Math	321,558	22.5	22,330	14.40	2.08	15.55	29.95
Social Science	172,803	12.1	17,652	9.79	1.89	8.71	18.50
Speech and Theater	40,122	2.7	2,847	14.09	2.27	17.89	31.98
Total	$1,428,371	100.0%	91,575	$15.60	2.01	$15.76	$31.36

[1] SCH: Student Credit Hour.

The amount of supportive expenses distributed to the instructional departments in this manner is added to the other indirect departmental expenses which are obtained from official records of the college and the direct salary cost of the department. The total expenditure for the department is divided by the direct salary cost for the department to obtain a ratio of total departmental expense to the expense for salaries directly assignable to student credit hours. The direct salary cost per student credit hour for each course in the respective department is then multiplied by the Total Departmental Expense (TDE) Ratio to arrive at the total cost per student credit hour. The procedure followed to arrive at the TDE Ratio for each department is shown for one of the sample institutions in Table 2. A completed Data Form III shown in Appendix D illustrates how the TDE Ratio of 2.08 for science and mathematics courses is applied to the direct salary cost of $11.84 for Mathematics 115 to determine the total cost per student credit hour.

To calculate the unit cost of educating a student in a curriculum the credit hour value of each course included in a curriculum is multiplied by its respective total cost per student credit hour and the products summed. This figure, which is the total two year cost of educating a student in that curriculum, is divided by two in order to convert the cost to an annual basis. An example of this procedure is shown in Appendix E for a curriculum from one sample college.

This introductory chapter has presented the problem, the purpose, the sample, and the analyzing procedure. The following chapter presents research and writings related to this study.

TABLE 2.--Total Expenditure for Current Operation by Three Expenditure Classifications and Instructional Department, College B, 1964-65

Instructional Departments (1)	Allocated Expenditures Direct Teaching Salaries (2)	Allocated Expenditures Supportive Expenses (3)	Unallocated Supportive Expenditures (4)	Estimated Total Expenditures (5)	Ratio of Total Expenditures to Direct Teaching Salaries (Col. 5 ÷ Col. 2) (6)
Applied Science	$228,491	$120,840	$136,644	$485,975	2.13
Art	49,745	34,918	29,891	114,554	2.30
Business	101,021	19,218	60,636	180,875	1.79
Language	297,597	41,971	177,637	517,205	1.74
Music	37,929	17,354	23,059	78,342	2.07
Nursing	123,836	75,542	74,300	273,678	2.21
Physical Education	44,321	34,441	26,475	105,237	2.37
Retailing	10,948	13,341	6,832	31,121	2.84
Science and Math	321,558	154,376	192,154	668,088	2.08
Social Science	172,103	50,110	103,336	326,249	1.89
Speech and Theater	40,122	27,808	23,058	90,988	2.27
Total	1,428,371	589,919	854,022	2,872,312	2.01

CHAPTER II

BACKGROUND TO THE STUDY

Although previous studies have computed average unit cost figures for all students in an institution, a department, or a course; previous research is lacking on the differential cost of educating a student in a specified curriculum such as Pre-Law, Dental Assisting, or Automotive Technology. This type of research is becoming more necessary as many state systems of higher education are being developed and boards of higher education are charged with the responsibility of allocating limited financial resources to institutions and at the same time assure themselves that expensive educational curricula of a specialized nature will be operated in adequate quantities in the state.

This chapter presents research and writings which are closely related to the methods and procedures used in this study.

The National Committee on Standard Reports for Institutions of Higher Education as early as 1935 had developed a method of computing unit costs. In presenting the method of unit cost computation, the Committee (19) stated:

> If properly conducted, cost studies should be of value in the internal administration, . . . in determination of the rates of student fees, in preparation of the budget, in educational surveys, in accreditation of educational institutions, and in the determination of desirable reorganization within an institution or within systems of higher education.

The California and Western Conference Cost and Statistical Study (2) states:

> ....future cost studies should be based on the production-function concept. This is a more complete description of all factors--as to kind and quality--which go into the creation of a given educational environment for various numbers of students. One of the most useful aspects of the production-function data is that their use permits intelligent projection into the future with respect to the changed enrollments under the same policy instructions and comparison of existing policy with proposed changes in policy.
>
> As the number of students in an institution increases, total instructional costs will also increase. Unit costs may well decline as unfilled capacity is utilized, but successive increases in unit costs (again followed by declines with further enrollment) must also be expected as capacity is reached and large increments of additional inputs are required.
>
> The same reasoning applies to changes in 'student mix'--the number of students following different curricula, at various instructional levels--within any given institution. If changes are taking place in the student mix, an institution may have a declining enrollment, yet require more funds for current operation. The opposite may be the case.
>
> As new areas of instruction are added to keep pace with scientific and technological progress, the costs of the new programs almost certainly will be high. Unit costs could be minimized in an institution if all students followed the same curriculum because a minimum number of courses would be required and optimum class size would most nearly be attained. Such a policy is not likely to meet the broad needs of society or individual students. A broadening of curricula is probable and it is important to recognize that higher education is likely to become more costly and that financial requirements of colleges and universities will rise accordingly.

Calkins (3) studied the unit expenditure of higher education programs in 145 private, four-year liberal arts colleges for fiscal year 1957-58. The analysis revealed a cost differential between four-year professional and semi-professional programs (Type A) and the pre-graduate school or non-vocational (Type B) programs which require additional academic preparation of a professional type before the graduate is prepared to enter the given profession. Type B curricula were found to be more expensive than Type A, and Type B curricula are associated with colleges which tend to enroll a high proportion of either men or women. Men's colleges were found to have a significantly higher cost than women's colleges. It seems that these liberal arts colleges are willing to spend more per student in those curricula which enroll students who are more likely to continue their education in advanced professional or graduate school than in curricula which prepare students to enter the job market at the end of a four-year program.

A regression analysis revealed that measures of institutional size, program scope, and curricular emphasis are significantly related to the costs of supplying higher education in these four-year liberal arts colleges.

An analysis of expenditures by McLure and others (17) in 1959-60 of seventeen newly maturing comprehensive - type junior colleges revealed that the average cost per academic student for current operation was approximately 85 percent of the cost per student in semi-technical and technical curricula. Projected costs of technical and semi-technical programs for 1965-66 based on 1959-60 prices produced an estimated total cost of operation of $1,000 per full-time student and $625 per full-time-equivalent student on a part-time basis. Application of the 85 percent factor to these figures results in an estimated cost of $850 per full-time student and $531 per part-time student in academic-type transfer programs. The ratio of semi-technical and technical programs to academic-type transfer programs is approximately 1.2 to 1.0 based on the projections of the 1959-60 cost analysis. In addition it was estimated that the capital outlay costs for properly designed campuses will cost at least $3,000 per full-time student, exclusive of facilities for residence.

The Liaison Committee of the Regents of the University of California and the California State Board of Education (15) analyzed the current expenses of the University of California, the state colleges, 44 public junior colleges, and 22 participating private institutions for fiscal year 1953-54. Junior college vocational-technical curricula were found to be relatively more expensive than academic-type curricula and will therefore greatly influence the expense per student credit hour. Three unit costs were computed for each of the institutions. They were cost per student credit hour for teaching expense (cost of salaries of instructors and clerical salaries, supplies, and equipment related to teaching), cost per student credit hour for departmental teaching expense (all teaching expense plus all other departmental expenses including those for faculty or departmental research and departmental administration), and cost per student credit hour for institutional teaching expense (all of the institutional expenses except those for summer sessions, extension and public service, organized research, auxiliary enterprises, and student aid). For the 44 public junior colleges the cost per student credit hour for teaching expense varied from a low of $6.66 to a high of $26.78 with a median of $11.08. The departmental teaching expense per student credit hour varied from a low of $6. 66 to a high of $28. 66 with a median of $11. 70. When adult education is included the total institutional teaching expense per student credit hour varies from a low of $11. 04 to a high of $41. 92 with a median of $18. 33. The three unit cost expenditure figures for the institutions with the low, median, and high expenditure per student credit hour for education and general purposes is presented in Table 3.

TABLE 3.--Expenditure per Student Credit Hour:Low, Median, and High Institutions, 1953-54

Rank	Institution	Exp. Per SCH for Teaching	Dept. Teaching Exp. per SCH	Institutional Teaching Exp. per SCH (Including Adult Education)
Low	1-11-10	$ 7.85	$ 7.85	$11.04
Median	1-04-35	11.58	12.34	18.33
High	1-09-05	26.78	28.66	41.92

Source: (15)

The Technical Committee on Cost of Higher Education in California (21) analyzed expenditures for costs of higher education at the five University of California campuses, eleven state colleges, and 24 public junior colleges for the 1957-58 fiscal year. The unit costs for the junior colleges with the low, median, and high expenditures per student credit hour and per full-time student are presented in Table 4.

TABLE 4.--Expenditure per Student Credit Hour and Per Full-Time Student: Low, Median, and High Institutions, 1957-58

Rank	Institution	Teaching Expense Per SCH	Teaching Expense Per FTE	Instit. Teaching Exp. Per SCH	Instit. Teaching Exp. Per FTE
Low	Fullerton	$11.81	$342	$20.63	$598
Median	Modesto	14.86	431	25.27	733
High	Cerritos	25.20	731	43.58	1258

Source: (21)

The Committee (21) estimated that a typical junior college plant costs (in terms of 1958 dollars) approximately $3,200 per ADA for a capacity of 2,000 students, $2,800 for a campus of 4,000 students, and $2,500 for a campus of 8,000 students. These estimates were based upon an analysis of the costs of new junior college campuses in California.

The Budget Formula Committee of the Illinois State Board of Higher Education (8) analyzed the direct instructional costs (faculty salary costs directly related to the production of student credit hours of instruction) by subject field and level of student for the four institutions under the Board of Governors of State Colleges and Universities and the University of Illinois for the fall semester, 1964-65. Selected common subject field expenditures for direct salary costs for each of the institutions are presented in Table 5.

TABLE 5.--Direct Instructional Cost Per Student Credit Hour, Freshman and Sophomore Students, Fall, 1964-65

Subject Field	Eastern Ill. University	Western Ill. University	Ill. State University (Normal)	Northern Ill. University	Univ. of Ill.
Art	$12.25	$ 4.22	$15.88	$ 8.24	$23.88*
Foreign Lang.	13.30	6.33	16.94	11.75	12.40
Home Economics	20.93	12.78	18.34	18.18	14.98
Library Science	9.79	6.32	34.47	14.38	19.91
Mathematics	6.30	6.42	7.25	9.38	9.82
Social Science	7.06	4.97	6.98	----	7.11

*Fine Arts Source: (8)

Keene (13) analyzed the current expenditure data for 1957-58 through 1961-62 of all the Florida public junior colleges in an attempt to discover the relationship between current expense and unit costs. An opportunity unit (number of different courses offered each year) was developed to measure "scope of opportunity." He found that in institutions with an average daily attendance of less than 400 students it costs about two and one-half times as much to offer one-half as much "scope of opportunity" as it costs in institutions above 400 in average daily attendance. Keene recommended that no junior college of less than 400 students in average daily attendance be established.

A weighting formula for calculating the financial needs of a junior college was developed by Keene. Vocational-technical students were weighted 1.75 for class size plus 0.176 for depreciation of equipment which sums to a total weighting of 1.926. Each full-time equivalent adult student was assigned a weighting of 1.40 based on class size. The weightings were based on a class size of 35 for academic classes, 29 for vocational-technical classes, and 25 for adult classes. The weighting for depreciation of equipment was based on a 100 dollar per student annual additional expense for equipment in vocational-technical courses.

These weightings are for the broad range of vocational and technical curricula offered in all Florida junior colleges in 1961-62. They provide equal weight to vocational and technical students enrolled in curricula which cost $1,500 per student and those which cost $600 per student. No adjustment is made for the curricula mix offered at a given institution. This method of support could encourage institutions to provide only the least expensive vocational and technical curricula and fail to encourage the development of the more expensive ones.

None of the above studies shows the variation in expenditure per student among the various curricula. Hence, there are no results of research for use in projecting financial policy at the state level concerning cost differentials in the types and numbers of different curricula offered in the various institutions. The best available weightings are gross and do not permit distinction at the curriculum level, and this is the crucial level for decision and action in the implementation of educational objectives.

Economists have interests in cost analysis which have a bearing on the problem of this study. These interests arise from their study and research of the economic effects of education. Questions are beginning to be raised about the economic benefits which accrue to society and the individual as a result of enrollment and graduation in one curriculum versus another. Eventually the question will be asked if the economic and social benefits to society and individuals are less, equivalent to, or greater as a result of enrollment in a junior college, a four-year college, or a multi-university. A review of some of the recent writings which relate to these questions is presented below.

Hirsch (9) defines the costs of public education as the resources of society drawn away from alternative uses. The following items of cost were utilized in a cost-benefit analysis conducted to try to quantify some benefits and costs of the proposal for universal junior college education made by the Educational Policy Commission of the National Education Association in 1964:

> A. Direct operating costs, i.e., salaries and wages, and purchases of nondurable commodities and current services.
>
> B. Capital resource costs, i.e., the value of capital stocks employed.
>
> C. Imputed operating costs, i.e., foregone earnings and miscellaneous costs to students and their parents.

Hirsch (9) defines the benefits of education as the increased resources available to society, both social and individual. The specific benefits listed are "the students, incremental output, decline in demands for public services, education-induced increments in the social products of second parties, intangible long-run community and personal benefits, and job opportunities for others which arise when members of the labor force enter junior college on a full-time basis."

The results of a cost-benefit analysis of two years of junior college education for males and females in 1960 indicate that the male student attendance will yield a net benefit of $2,107, or 95 cents over each dollar of costs. Female attendance in junior college produces a net cost of $254 or a return of only 8 cents for each dollar of costs. The benefit cost ratios are 1.95 and .89 respectively. When adjustments are made for a 50 percent decrease in incremental earnings and a ten percent increase in cost due to the lower average ability of the students who are not now attending college the corresponding benefit cost ratios only include the incremental earnings and do not take into consideration the other benefits of education.

Hirsch states that tools such as system analysis, benefit-cost analysis, and program budgeting promise to improve rational decisions for education. He suggests further studies to investigate whether new and better education will equip students for changing opportunities or only increase the education level of those saddled with obsolete skills.

Harris (6) projects an increase in expenditure for higher education of 170 percent from 1957-58 to 1969-70 and an increase in enrollment of about 90 percent. It can be seen that more than one-half of the rise in expenditures is to be associated with increased enrollments. In addition to the projected increase in expenditure for current operation he predicts that the capital budget will double to reach $1.5 billion per year in 1969-70.

Harris predicts that the relative contribution of tuition will increase from 25 percent in 1957-58 to 40 percent by 1970, and the contribution of government will decline from 48 percent to 38 percent for the same period. If resources are not made available in these amounts he thinks the net effect will be a decline in the quality of product rather than a limiting of enrollments. He predicts an increase in average cost per student from $1,070 in 1957-58 to $1,520 by 1969-70, an increase of more than 40 percent.

Harris expects a shift in the total enrollments in higher education toward the low-cost units found in junior colleges, the commuting institutions, and the urban colleges. He found the average cost per junior college student to be $600 in 1960, compared to an over-all average of about $1,000. The projected shift of students toward these low cost units may result in saving of about $250 million annually by 1970.

Harris (6) makes the following evaluation of unit costs:

> ...we are unable to measure the extent to which the rise in unit costs of higher education reflects an improvement in the product. Insofar as it does, then to that extent the rise reflects not inefficiency, but an improved product. Though we have vague notions and measures of rising productivity, they are inadequate. The greatest obstacle is that...a measure of input (the quality of the student) is virtually nonexistent.
>
> ...I am hopeful that despite the increase of unit costs associated with a rising standard of living...we can introduce economies which will largely offset these rises in costs. First we can save a great deal by

> increasing the size of our units. In 1956, . . . 1, 314, or 71 percent of the total number of institutions had enrollments of less than 1, 000. Liberal arts colleges (530), teachers colleges (101), and junior colleges (434) account for most of these low-enrollment units. These institutions should increase their enrollment greatly. There is no excuse on economic grounds for colleges of less than 1, 000.
>
> . . . when a new program is to be introduced, the authorities should estimate the minimum amount of money required to run it, irrespective of the number of students. Then costs should be estimated on the basis of varying enrollments under a particular program.
>
> . . . what is disturbing is that colleges as a rule are not inclined to estimate their unit costs for services already being given. . . . major universities do not. . . estimate the cost of, say, the freshman curriculum, the cost of running a particular department, or, more important the cost of turning out a student in one department rather than another, no attempt is generally made to estimate the cost of giving a particular course. . . . It would be helpful, for example, to know how much it would cost to turn out a student in paleontology, say, twenty-five years ago and today, and also to measure against this the value to society and to the student of the output of a palentology student today or against twenty-five years ago.

There is no reason to assume that the above evaluation is not generalizable to junior colleges. If so, it is clear that cost analysis studies are long overdue in junior colleges as well as four-year colleges and universities. During the past fifty years junior colleges have been emerging as institutions. They have had to devote most of their time and resources to meeting the daily and yearly needs of a fast growing population of students. Now that a large percentage of the lower division students in higher education attend junior colleges, it is time that they devote more time and resources to research, planning and development so that the quality of the graduates will improve along with the growth in numbers. It is within this context that this study is conducted.

CHAPTER III

INTER-CURRICULA COSTS IN EIGHT JUNIOR COLLEGES

This chapter shows the estimated annual cost of educating a student in each of the various curricula offered in eight sample institutions during 1964-65 and the relationship of the costs for vocational and technical curricula to the average cost for liberal arts curricula. The relationship of vocational and technical curricula costs in each of eight clusters or types of curricula to the average cost for liberal arts curricula is shown for all institutions in the study.

The data in Table 6 show the estimated annual cost of educating one student in each of the vocational and technical curricula offered in the year studied and the average cost for a student in the liberal arts or transfer curricula. All liberal arts and transfer curricula are grouped together because the courses included in them consist of a large component of general courses which are common to almost all of these curricula. This commonality of courses among curricula results in curricula unit costs which are similar for almost all liberal arts and transfer curricula in an institution. The vocational and technical curricula have a low proportion of general courses which are common across all curricula and a high proportion of the more expensive specialized courses. This results in a greater variability in the unit costs for vocational and technical curricula than is found among the liberal arts and transfer curricula. Therefore, the average cost for the liberal arts and transfer curricula is a relatively stable basic cost figure for each institution to which the differential costs of vocational and technical curricula can be compared. The individual vocational and technical curricula are listed by type in order to facilitate analysis and comparison.

The average annual cost of educating a student in liberal arts at Institution A was $821. All of the vocational technical curricula in applied arts, engineering technologies, health and medical occupations were more costly than liberal arts. The most expensive curriculum was Electronic Technology which cost $1, 655 per student per year followed by Metallurgical Technology at $1, 176, Nursing at $1, 173, Automotive Technology at $1, 133, Drafting Technology at $1, 052, and Art Design at $1, 017.

All of the curricula in the business and office occupations except one were less costly than liberal arts. The least costly curriculum in Institution A was General Business Administration at $585. The one year Secretarial curriculum at a cost of $833 was more costly per student, but only by a few dollars.

The annual average cost for a student in liberal arts at Institution B was $1, 057. All of the vocational and technical curricula outside of business and office occupations and public services were more costly than liberal arts. Automotive Technology was the most expensive at an annual cost of $2, 424, followed by Dental Assistant at $1, 979, Mechanical Technology at $1, 752, and Electrical Technology at $1, 609. All of the curricula in the business and office occupations were less costly on a per student basis than liberal arts. Again all of the curricula in the business and office occupations with the exception of a specialized secretarial curriculum were less expensive than liberal arts. The Secretarial curriculum at $1,099 was only slightly higher than the $1,057 figure for liberal arts. The least expensive curriculum in this institution was in the field of public service. Police Administration cost $788 per student which seems to be significantly lower than liberal arts and most of the vocational and technical curricula. An examination of the courses included in this curriculum reveals that less than 25 percent of the courses are of a specialized nature with relatively high unit costs.

Institution C had an average annual cost of $937 for liberal arts. All of the engineering technologies and two of the three health and medical occupations were more expensive per student than liberal arts. Chemical Technology at a cost of $1,900 was the most expensive curriculum, followed by Mechanical Technology at $1,465, Civil Technology at $1,455, Medical Office Assistant at $1,279, and Dental Hygiene at $1,127. All of the Business and Office Occupations and X-Ray Technology were less costly on a per student basis than liberal arts curricula. The least expensive curricula were General Business Administration at $615 and X-Ray Technology at $616.

Institution D has an average annual cost per student in liberal arts of $722. All of the curricula in the engineering technologies, health and medical occupations, and industrial technical occupations

TABLE 6. --Estimated Cost of Educating a Student in Each Curriculum Offered During 1964-65 in Eight Sample Institutions

Curriculum	Institution A (1)	B (2)	C (3)	D (4)	E (5)	F (6)	G (7)	H (8)
Liberal Arts:	$ 821	$1057	$ 937	$ 722	$ 647	$ 524	$ 990	$ 875
Applied Arts:								
Art Design	1017							
Photography							2246	
Engineering Technologies:								
Civil Technology			1455	1121		1417		
Chemical Technology			1900	1534				
Electrical and Electronic Technology	1655	1609	1010	852	2661	1032	3151	1003
Mechanical Technology		1752	1465	1064	1660	1193		
Metallurgical Technology	1176							
Business and Office Occupations:								
Advertising								802
Accounting	616	813	749	505	690	488	880	816
Banking, Insurance, and Real Estate				567			1032	416
Business Machine Operator		958						
General Business Administration	585	1009	615	587	659	541		820
Management					747	1022		637
Marketing			699			716	858	
Secretarial (2 years)	775	982	828	824	660	541	1078	1017
Secretarial (1 year)	833	882						

TABLE 6 - Continued

Curriculum	Institution A (1)	 B (2)	 C (3)	 D (4)	 E (5)	 F (6)	 G (7)	 H (8)
Secretarial (Medical, Legal, and Engineering)	$	$1099	$ 912	$	$ 627	$ 554	$1022	$ 990
Retailing	654	1032			645			708
Health and Medical Occupations:								
Dental Assistant		1977		1406			1099	
Dental Hygiene			1127	1428	1929		914	
Medical Laboratory Technology				1028				
Medical Office Assistant			1279					
Nursing	1173				793	1082		
X-Ray Technology			616				1343	
Industrial Technical Occupations:								
Aeronautical Technology						1175		
Air Conditioning Technology				1215		788		
Automotive Technology	1133	2424		1333				
Architectural and Construction Technology				845		1218		
Drafting Technology	1052						1377	820
Electronic Data Processing						656	1293	737
Instrumentation Technology						894		
Machine Tool Technology							863	
Graphic Arts Technology						1477		
Radio and Television					2378			
Technical Communications							1343	1112
Technical Publication Specialist							983	

TABLE 6 - Continued

Curriculum	Institution A (1)	 B (2)	 C (3)	 D (4)	 E (5)	 F (6)	 G (7)	 H (8)
Trades and Industrial Fields:								
Auto Body Mechanic	$	$	$	$	$	$	$	$ 748
Auto Body Repair								635
Heavy Equipment Mechanics								868
Industrial Supervision								738
Welding								1123
Dietetics and Home Economics Occupations:								
Dietician Aid								659
Interior Design						694		
Food Service Management						546		
Home and Family Life						813		645
Fashion Design						1097		
Modern Woman								832
Public Service Occupations:								
Aviation Administration						641		
Forensic Service						504		
Industrial Group Work Supervision								424
Municipal Public Administration						615		
Recreational Leadership						428		
Police Administration		788			701	398	740	

were more expensive than liberal arts. All of the curricula in the business and office occupations except a two-year secretarial curriculum were less expensive than liberal arts. The most expensive curriculum was Chemical Technology at an annual per student cost of $1,534 followed by Dental Hygiene at $1,428, Dental Assistant at $1,406, Automotive Technology at $1,333, Air Conditioning Technology at $1,215, Civil Technology at $1,121, and Mechanical Technology at $1,064. The least expensive curriculum was Accounting at $505 per student, but the two-year Secretarial curriculum at a cost of $824 was more expensive than liberal arts by approximately $100 per student.

Institution E had an average annual cost of $647 per student in liberal arts and other transfer curricula. All vocational and technical curricula except two in business and office occupations were more expensive on a per student basis than the average for liberal arts. The Electronic Technology curriculum at $2,661 was the most expensive followed by Radio and Television at $2,378, Dental Hygiene at $1,929 and Mechanical Technology at $1,660. The Legal Secretary curriculum at $627 and Retailing at $645 were the only ones which were less expensive than liberal arts. In this institution four of the six curricula in business and office occupations are slightly more expensive than the liberal arts and transfer curricula. It is interesting to observe that this institution has a rather low per student cost figure for liberal arts when compared with six of the other seven institutions studied.

Institution F had an average annual cost per student of $524 for liberal arts and transfer curricula. All except four of the 25 vocational and technical curricula for which cost estimates are shown were found to be more costly per student than liberal arts. The most expensive curriculum was Graphic Arts Technology at $1,477 followed by Civil Technology at $1,417, Architectural Technology at $1,218, Mechanical Technology at $1,193, Electrical Technology at $1,032, and Management at $1,022.

The least expensive curricula in Institution F were in public service occupations and in the business and office occupations. The per student cost for Police Administration was $398, Recreational Leadership $428, Accounting $488, and Forensic Service $504.

Institution G had an average annual cost per student of $990 for liberal arts and other transfer curricula. Ten of the sixteen vocational and technical curricula were more expensive per student than liberal arts and transfer curricula. The most expensive vocational technical curriculum in this institution was Electronic Technology at $3,151 per student. This is followed by Photography at $2,246, Electronic Data Processing at $1,377, Technical Communications at $1,343, X-Ray Technology at $1,343 and Electronic Data Processing at $1,293.

The least expensive curricula were in the public service occupations and business and office occupations. Police Administration at $740 per student was the least expensive curriculum followed by Marketing at $858.

The average annual cost for a student in liberal arts and other transfer curricula was $875 at Institution H. The data for this institution does not follow the same pattern of costs as found in the previous seven sample institutions. Sixteen of the 21 vocational and technical curricula were found to have an annual per student cost less than the average of $875 found for liberal arts and transfer curricula.

The most expensive curriculum in Institution H was the one-year Industrial Welding program in the trades and industrial field with a cost per student of $1,123. Technical Communications at $1,112 was the second most expensive curriculum followed by the two-year Secretarial at $1,017 and Electronic Technology at $1,003.

Inter-Institutional Comparison of Curricula Costs

The data presented in Table 7 shows a ratio of the annual cost of educating a student in each of the vocational and technical curricula to the cost for a student in liberal arts in the same institution. These ratios were calculated by dividing the cost figure for each vocational and technical curriculum by the cost for liberal arts shown in Table 6. This transforms the figure for liberal arts into a standard ratio of 1.00 and relates the cost of all other curricula to it.

In this way it is possible to compare the cost of curricula or types of curricula across institutions. Column 10 of Table 7 shows the average ratio for each curriculum in the institutions which offered it in 1964-65. The average cost ratio for Engineering Technology curricula offered in at least two institutions varies from a low of 1.91 for Mechanical Technology to a high of 2.08 for Chemical Technology. Electrical or Electronic Technology was offered in all eight of the sample institutions and had an average cost ratio of 2.03. Institutional ratios varied from a low of 1.08 to a high of 4.11. Part of the high ratio may be explained by the relatively low cost per liberal arts student in Institution E and the low enrollment in the Electronic Technology curriculum.

The average cost ratio for business and office occupations curricula offered in at least two institutions varied from a low of .77 for Banking, Insurance, and Real Estate to a high of 1.27 for Management. Only a very few of the individual ratios were greater than 1.10 or lower than .70. A majority of the ratios in this area were between .75 and 1.00.

The average cost ratio for curricula leading to health and medical occupations varied from a low of 1.01 for X-Ray Technology to a high of 1.77 for Dental Hygiene. The average ratio for Nursing was 1.67. None of the curricula in this group had an average cost ratio of less than 1.00.

The average cost ratio for curricula leading to industrial technical occupations offered in at least two institutions varied from a low of 1.20 for Electronic Data Processing to a high of 1.84 for Automotive Technology.

Curricula in trade and industrial fields, dietetics and home economics occupations, and public service occupations were not offered in enough institutions to make averages meaningful for individual curricula.

TABLE 7.--Ratio of Vocational and Technical Curricula Unit Costs Compared to the Unit Costs of Liberal Arts Curricula in Eight Sample Institutions, 1964-65

Curriculum (1)	Institution A (2)	B (3)	C (4)	D (5)	E (6)	F (7)	G (8)	H (9)	Ave. (10)
Liberal Arts:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Applied Arts:									
Art Design	1.24								1.24
Photography							2.27		2.27
Engineering Technologies:									
Civil Technology			1.55	1.55		2.70			1.93
Chemical Technology			2.03	2.12					2.08
Electrical and Electronic Technology	2.02	1.52	1.08	1.18	4.11	1.97	3.18	1.15	2.03
Mechanical Technology		1.66	1.56	1.47	2.56	2.28			1.91
Metallurgical Technology	1.43								1.43
Business and Office Occupations:									
Advertising								.92	.92
Accounting	.75	.77	.80	.70	1.07	.93	.89	.93	.86
Banking, Insurance, and Real Estate				.79			1.04	.48	.77
Business Machine Operator		.91						.94	.93
General Business Administration	.71	.95	.66	.81	1.02	1.03			.86
Management					1.15	1.95		.71	1.27
Marketing			.75			1.37	.87		1.00
Secretarial (2 years)	.94	.93	.88		1.02	1.03	1.09	1.16	1.01
Secretarial (1 year)	1.01	.83							.92
Secretarial (Medical, Legal, and Technical)		1.04	.97	1.14	.97	1.06	1.03	1.13	1.05
Retailing	.80	.98			1.00			.81	.90

TABLE 7 - Continued

Curriculum	Institution								Ave.
	A	B	C	D	E	F	G	H	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Health and Medical Occupations:									
Dental Assistants		1.87					1.11		1.49
Dental Hygiene			1.20	1.98	2.98		.92		1.77
Medical Laboratory Technology				1.42					1.42
Medical Office Assistant			1.36						1.36
Nursing	1.43			1.95	1.23	2.06			1.67
X-Ray Technology			.66				1.36		1.01
Industrial Technical Occupations:									
Aeronautical Technology						2.24			2.24
Air Conditioning Technology				1.68		1.50			1.59
Automotive Technology	1.38	2.30		1.85					1.84
Architectural and Construction Technology				1.17					1.17
Drafting Technology	1.28						1.39	.94	1.20
Electronic Data Processing						1.91	1.31	.84	1.35
Instrumentation Technology						1.71			1.71
Machine and Tool Technology							.87		.87
Graphic Arts Technology						2.82			2.82
Radio and Television					4.52				4.52
Technical Communication							1.36	1.27	1.32
Technical Publication Specialist							.99		.99
Trades and Industrial Fields:									
Auto Body Mechanics								.85	.85
Auto Body Repair								.73	.73
Heavy Equipment Machinery								.99	.99
Industrial Supervision								.84	.84
Welding (1 Year)								1.28	1.28

TABLE 7 - Continued

Curriculum (1)	Institution A (2)	B (3)	C (4)	D (5)	E (6)	F (7)	G (8)	H (9)	Ave. (10)
Dietetics and Home Economics Occupations:									
Dietician Aid								.76	.76
Interior Design						1.32			1.32
Food Service Management						1.04			1.04
Home and Family Life						1.55		.79	1.15
Fashion Design						2.09			2.09
Modern Woman								.95	.95
Public Service Occupations:									
Aviation Administration						1.22			1.22
Forensic Service						.96			.96
Industrial Group Work Supervision								.48	.48
Municipal Public Administration						1.17			1.17
Recreational Leadership						.82			.82
Police Administration		.75			1.08		.75		.86

A visual analysis of the cost data presented in Table 6 suggests to the investigator that a more comprehensive statistical analysis on a state-wide basis with larger numbers of institutions would be likely to reveal "high cost" curricula at crucial stages of development as well as provide some indications of the number of students required to offer each curriculum at an economical unit cost. An analysis such as this would make it possible to see how resources are allocated throughout a state in relation to a number of variables such as enrollment, man-power demands, educational needs, type of institution, etc.

Cost Ratios by Type of Curriculum

The average cost ratio for eight types of vocational and technical curricula to the cost of liberal arts and transfer curricula is shown for all sample institutions in Table 8.

Two institutions in the sample offered one curriculum each in applied arts. The average ratio for these two curricula was 1.76. The number of curricula and institutions represented is too small to be useful in generalizing to other institutions of like character.

The average cost ratio of the engineering technology curricula was 1.95. This represents an average for nineteen curricula offered in eight sample institutions. The ratio of 1.95 means that in these institutions if it cost $1,000 to educate a student for one year in a liberal arts or transfer program, it costs on the average about $1,950 to educate a student in the engineering technologies. This figure includes expenditures for current operation and excludes expenditures for original equipment, capital outlay, and debt service.

The average cost ratio for business and office occupations was .95. This represents an average for 46 total curricula offered in 8 institutions. This ratio of .95 means that in these sample institutions if it cost $1,000 to educate a student in a liberal arts or transfer curricula it costs an average of $950 for the curricula in Business and Office Occupations.

The average cost ratio for the health and medical occupations was 1.49. This represents an average for fourteen curricula offered in seven institutions.

Six institutions offered nineteen curricula leading toward industrial technical occupations. The average cost ratio was 1.52. Two institutions offered seven curricula leading to dietetics and home economics occupations with an average cost ratio of 1.21. This means that when the average cost to educate a student in the liberal arts and transfer curricula was $1,000 it costs about $1,500 for curricula leading to health and medical occupations and industrial technical occupations and about $1,200 for dietetics and home economics occupations.

The average cost ratio in four institutions for seven curricula leading toward employment in public service occupations was .96. This ratio of .96 means that it costs slightly less to educate a student in a curriculum which leads to a public service occupation at the end of two years than it costs to educate a student in a liberal arts or transfer curriculum.

TABLE 8.--Ratio of Vocational and Technical Curricula Unit Costs in Each of Eight Categories to the Unit Costs of Liberal Arts Curricula in Eight Sample Institutions, 1964-65

Categories (1)	Number of Institutions (2)	Number of Curricula (3)	Average Ratio (4)
Liberal Arts	8	-	1.00
Applied Arts	2	2	1.76
Engineering Technologies	8	19	1.95
Business and Office Occupations	8	46	.95
Health and Medical Occupations	7	14	1.49
Industrial Technical Occupations	6	19	1.52
Dietetics and Home Economics Occupations	2	7	1.21
Public Service Occupations	4	7	.96

CHAPTER IV

FACTORS AFFECTING THE DIFFERENTIAL COST OF CURRICULA

Chapter III has shown the inter-institutional costs of the various curricula offered in eight junior colleges and the intra-institutional relationship of those costs to the cost for liberal arts and transfer curricula in each of eight types of curricula. This chapter is an analysis of the differential unit costs of curricula in each of the institutions to identify the factors which contribute to the variance in curricula cost.

In this study the cost of educating a student in a curriculum is determined by the type, credit hour value, and cost per student credit hour of the courses included in the curriculum. Tables 9 through 16 present some of the data on individual institutions necessary to understand what factors affect the unit cost of a curriculum.

Column 5 of Table 9 shows that for Institution A the average cost per student credit hour for general courses does not vary significantly from the liberal arts curricula to the vocational and technical curricula. The cost per student credit hour for general courses varies from a low of $18.26 in Retailing to a high of $24.51 in liberal arts and transfer curricula. In Institution A as well as a majority of the other sample institutions the average cost per student credit hour for the general courses in the vocational and technical curricula is slightly less than it is for liberal arts and transfer curricula.

TABLE 9.--Credit Hours and Unit Costs by Type of Course and Curriculum, Institution A, 1964-65

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses			Vocational Technical Courses			Annual Cost Per (FTE) Student (9)
		Number of Credit Hrs. in the Curriculum (3)	Percent of Total Credit Hours (4)	Aver. Cost Per SCH (5)	Number of Credit Hrs. in the Curriculum (6)	Percent of Total Credit Hours (7)	Aver. Cost Per SCH (8)	
Liberal Arts and Transfer	1228	67	100%	$24.51	0	0%	$ 0	$ 821
Applied Arts:								
Art Design	17	29	46	20.38	34	54	42.41	1017
Engineering Technology:								
Electronic Technology	45	33	51	21.09	32	49	81.69	1655
Metallurgical Tech.	29	37	57	21.62	28	43	55.46	1176
Business and Office Occupations:								
Accounting	14	27	43	20.30	36	57	19.00	616
General Business	18	17	27	20.70	45	73	18.18	585
Secretarial (2 year)	51	17	25	21.12	51	75	23.33	775
Secretarial (1 year)	--	6	17	22.83	29	83	24.00	833
Retailing	6	27	40	18.26	40	60	32.70	654
Health and Medical Occupations:								
Nursing	101	20	33	24.80	40	67	46.42	1173
Industrial Technology:								
Automotive Technology	60	34	52	21.97	31	48	48.97	1133
Drafting Technology	50	31	48	21.22	34	52	42.50	1052

Neither the number of credit hours in general courses (column 3) nor the percent of credit hours taken in general courses (column 4) seems to have any consistant effect on the average cost per student credit hour. An analysis of the relationship between the percent of total credit hours in vocational and technical courses (column 7) and the annual cost to educate one student in each curriculum (column 9) revealed no consistant relationship between these two variables. This seems to hold for all eight sample institutions shown in Tables 9 through 16.

The number of full-time students enrolled in each curriculum is shown in column 2 of Tables 9 through 16. This study does not attempt to determine the effect of size upon the cost of educating a student in each of the curricula. By selecting sample institutions of at least 2, 000 full-time-equivalent students it can be assumed that some economy of scale has been reached in the liberal arts and transfer curricula of a majority of these institutions. However, the full-time enrollments in many of the vocational and technical curricula are much lower than the standards suggested by McLure (16) for post-high school technical curricula in comprehensive institutions with 3, 000 to 4, 000 students. McLure suggested a minimum of 40 full-time students and 40 part-time students in each of ten technical curricula in engineering and industrial fields. At least 40 students in each of eight non-industrial fields is suggested as a minimum number of full-time students necessary for economical operation of curricula, and in some of these areas such as general business and secretarial work a minimum of 100 is suggested. Based on the

TABLE 10.--Credit Hours and Unit Costs by Type of Course and Curriculum, Institution B, 1964-65

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses			Vocational Technical Courses			Annual Cost Per (FTE) Student (9)
		Number of Credit Hrs. in the Curriculum (3)	Percent of Total Credit Hours (4)	Aver. Cost Per SCH (5)	Number of Credit Hrs. in the Curriculum (6)	Percent of Total Credit Hours (7)	Aver. Cost Per SCH (8)	
Liberal Arts and Transfer:	1736	67	100%	$31.57	0	0%	$ 0	$1058
Engineering Technology:								
Electrical Technology	47	21	34	28.86	41	66	63.68	1609
Mechanical Technology	75	21	34	35.62	41	66	71.22	1834
Business and Office Occupations:								
Accounting	--	26	42	22.35	36	58	29.03	813
General Business	276	23	35	23.04	43	65	34.58	1009
Secretarial (1 year)	--	14	41	22.50	20	59	28.35	882
Secretarial (2 years)	50	18	29	23.06	45	71	34.40	982
Business Machine Operator	21	15	44	24.27	19	56	31.26	958
Medical Secretary	17	21	33	22.33	43	67	43.20	1099
Retailing	26	25	40	20.76	38	60	40.65	1032
Health and Medical Occupations:								
Dental Assistant	--	12	40	22.83	18	60	94.33	1972

TABLE 10 - Continued

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses: Number of Credit Hrs. in the Curriculum (3)	General Courses: Percent of Total Credit Hours (4)	General Courses: Aver. Cost Per SCH (5)	Vocational Technical Courses: Number of Credit Hrs. in the Curriculum (6)	Vocational Technical Courses: Percent of Total Credit Hours (7)	Vocational Technical Courses: Aver. Cost Per SCH (8)	Annual Cost Per (FTE) Student (9)
Industrial Technical Occupations: Auto Technology	24	21	34%	$35.62	41	66%	$99.98	$2424
Public Service: Police Administration	15	32	49	23.59	33	51	24.85	788

TABLE 11.--Credit Hours and Unit Costs by Type of Course and Curriculum, Institution C, 1964-65

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses: Number of Credit Hrs.[1] in the Curriculum (3)	General Courses: Percent of Total Credit Hours (4)	General Courses: Aver. Cost Per SCH (5)	Vocational Technical Courses: Number of Credit Hrs. in the Curriculum (6)	Vocational Technical Courses: Percent of Total Credit Hours (7)	Vocational Technical Courses: Aver. Cost Per SCH (8)	Annual Cost Per (FTE) Student (9)
Liberal Arts and Transfer:	369	105	100%	$17.98	0	0%	$-----	$ 937
Engineering Technologies:								
Chemical Technology	51	59	55	13.24	49	45	61.61	1900
Civil Technology	48	48	38	11.35	71	62	34.41	1466
Electrical Technology	157	41	37	9.73	70	63	23.17	1011
Mechanical Technology	106	44	39	12.70	70	61	35.30	1515
Business and Office Occupations:	395							
Business Administration		48	48	11.02	51	52	13.75	615
Accounting		32	29	12.31	78	71	14.15	749
Marketing		33	30	11.94	76	70	13.20	699
Engineering Secretary		39	36	15.77	68	64	17.78	912
Executive Secretary		39	36	12.31	70	64	16.80	828
Health and Medical Occupations:								
Medical Office Assistant	48	63	62	21.14	39	38	31.44	1279
X-Ray Technology	9	32	76	13.91	10	24	17.10	616
Dental Hygiene	68	30	27	14.63	83	73	21.87	1127

[1] The unit of credit in this institution is the quarter hour.

TABLE 12.--Credit Hours and Unit Costs by Type of Course and Curriculum, Institution D, 1964-65

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses			Vocational Technical Courses			Annual Cost Per (FTE) Student (9)
		Number of Credit Hrs.[1] in the Curriculum (3)	Percent of Total Credit Hours (4)	Aver. Cost Per SCH (5)	Number of Credit Hrs. in the Curriculum (6)	Percent of Total Credit Hours (7)	Aver. Cost Per SCH (8)	
Liberal Arts & Transfer:	577	108	100%	$13.37	0	0%	$-----	$ 722
Engineering Technologies:								
Chemical Technology	52	60	54	12.78	51	46	45.10	1534
Civil Technology	45	46	40	10.20	70	60	25.33	1121
Construction Technology	160	42	37	10.48	72	63	17.36	845
Electronic Technology	262	46	38	12.13	74	62	15.49	852
Mechanical Technology	114	46	40	10.20	70	60	24.67	1064
Business and Office Occupations:								
Accounting	147	34	30	10.32	80	70	8.74	525
Banking, Real Estate, and Insurance	51	31	27	8.71	82	73	10.52	567
Business Administration	263	43	37	10.67	74	63	9.65	587
Industrial Secretarial Science	65	45	44	11.31	58	56	19.64	824
Industrial Technical Occupations:								
Air Conditioning Tech.	50	53	49	11.77	56	51	32.36	1215
Automotive Technology	85	49	42	12.00	69	58	30.10	1333
Health & Medical Occupations:								
Dental Hygiene	101	33	27	21.82	89	73	24.00	1428
Medical Lab. Tech.	63	39	41	12.90	55	59	28.21	1028
Nursing	97	41	38	10.76	68	62	34.85	1406

[1] The unit of credit in this institution is the quarter hour.

TABLE 13.--Credit Hours and Unit Costs by Type of Course and Curriculum, Institution E, 1964-65

		General Courses			Vocational Technical Courses			
Curriculum (1)	Number of Full-Time Students Enrolled (2)	Number of Credit Hrs. in the Curriculum (3)	Percent of Total Credit Hours (4)	Aver. Cost Per SCH (5)	Number of Credit Hrs. in the Curriculum (6)	Percent of Total Credit Hours (7)	Aver. Cost Per SCH (8)	Annual Cost Per (FTE) Student (9)
Liberal Arts & Transfer:	3838	67	100%	$19.46	0	0%	$-----	$ 647
Engineering Technologies:								
Electrical Technology	64	26	36	19.00	46	64	99.97	2661
Mechanical Technology	19	34	49	19.26	35	51	76.11	1660
Business and Office Occupations:								
Accounting	0	26	41	20.35	37	59	23.00	690
Management	164	28	43	23.43	37	57	22.62	747
Executive Secretarial	63	16	25	19.44	47	75	21.45	660
General Business	47	30	46	15.77	35	54	24.14	659
Legal Secretary	94	16	25	19.44	47	75	20.04	627
Retail Mid-Management	42	19	30	18.11	45	70	21.00	645
Health and Medical Occupations:								
Dental Hygiene	61	29	41	25.66	42	59	52.14	1467
Nursing	137	29	42	18.17	40	58	20.60	676
Industrial Technical Occupations:								
Radio and Television	3	48	73	18.15	18	27	215.77	2378
Public Service Occupations:								
Police Administration	50	37	58	18.30	27	42	26.96	703

TABLE 14.--Credit Hours and Unit Costs by Type of Course and Curriculum, Institution F, 1964-65

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses: Number of Credit Hrs. in the Curriculum (3)	General Courses: Percent of Total Credit Hours (4)	General Courses: Aver. Cost Per SCH (5)	Vocational Technical Courses: Number of Credit Hrs. in the Curriculum (6)	Vocational Technical Courses: Percent of Total Credit Hours (7)	Vocational Technical Courses: Aver. Cost Per SCH (8)	Annual Cost Per (FTE) Student (9)
Liberal Arts and Transfer:	6373	65	100%	$15.98	0	0%	$-----	$ 524
Engineering Technologies:								
Civil Technology	9	32	46	23.38	38	54	48.47	1291
Electrical Technology	37	33	45	19.18	41	55	35.88	1052
Mechanical Technology	6	34	47	20.65	39	53	43.03	1190
Business and Office Occupations:								
Accounting	54	22	34	13.14	42	66	17.05	488
Business Administration	53	19	30	13.84	45	70	18.18	541
General Office Course	4	19	30	14.00	45	70	18.73	505
Management	14	19	27	18.58	51	73	33.16	1022
Marketing	16	25	38	14.36	41	62	26.29	719
Executive Secretary	--	22	34	14.14	42	66	18.33	541
Legal Secretary	--	16	25	12.69	48	75	18.08	536
Medical Secretary	--	25	39	14.84	39	61	19.79	572
Health and Medical Occupations:								
Nursing	65	16	24	12.69	50	76	28.86	823
Industrial Technical Occupations:								
Aerospace Technology	30	30	42	18.33	42	58	42.86	1175
Air Conditioning & Ref.	2	30	42	18.13	41	58	25.17	788

TABLE 14 - Continued

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses: Number of Credit Hrs. in the Curriculum (3)	General Courses: Percent of Total Credit Hours (4)	General Courses: Aver. Cost Per SCH (5)	Vocational Technical Courses: Number of Credit Hrs. in the Curriculum (6)	Vocational Technical Courses: Percent of Total Credit Hours (7)	Vocational Technical Courses: Aver. Cost Per SCH (8)	Annual Cost Per (FTE) Student (9)
Architectural Technology	8	30	41%	$23.45	44	59%	$39.34	$1218
Electronic Data Processing	88	44	60	19.00	29	40	21.52	730
Graphic Arts	4	25	33	16.16	50	67	50.22	1458
Instrumentation Technology	0	33	46	19.18	39	54	29.62	894
Dietetics and Home Economics Occupations:								
Interior Design	1	22	34	14.91	42	66	25.24	694
Food Service Management	0	16	24	12.69	51	76	18.88	580
Home and Family Life	2	34	52	14.88	32	48	34.97	813
Fashion Design	17	16	23	12.69	53	77	37.57	1097
Public Service:								
Aviation Administration	0	25	39	15.12	39	61	23.15	641
Forensic Service	17	34	52	15.21	32	48	15.56	508
Law Enforcement	18	31	47	13.16	35	53	11.63	408
Municipal Public Administration	0	25	34	17.04	49	66	16.39	615
Recreational Leadership	5	24	38	14.13	40	63	12.93	428

TABLE 15.--Credit Hours and Unit Costs by Type of Course and Curriculum, Institution G, 1964-65

		General Courses			Vocational Technical Courses			
Curriculum (1)	Number of Full-Time Students Enrolled (2)	Number of Credit Hrs. in the Curriculum (3)	Percent of Total Credit Hours (4)	Aver. Cost Per SCH (5)	Number of Credit Hrs. in the Curriculum (6)	Percent of Total Credit Hours (7)	Aver. Cost Per SCH (8)	Annual Cost Per (FTE) Student (9)
Liberal Arts and Transfer:	5205	64	100%	$30.94	0	0%	$-----	$ 990
Applied Arts:								
Photography	35	37	60	28.81	25	40	111.48	2246
Engineering Technologies:								
Electronic Technology	143	28	44	44.54	36	56	140.42	3151
Business and Office Occupations:								
Accounting	141	28	44	22.36	35	56	32.37	880
Insurance Adjusting	21	29	45	25.76	35	55	37.86	1036
Real Estate	58	25	39	23.80	39	61	37.41	1027
Marketing	0	26	41	30.54	38	59	24.26	858
Secretarial (2 years)	188	23	36	28.22	41	64	36.76	1078
Secretarial (Legal)	---	23	35	28.22	42	65	33.12	1020
Secretarial (Techn.)	2	20	32	27.25	42	68	35.76	1024
Health and Medical Occupations:								
Dental Assistant	46	28	44	21.54	36	56	21.54	1099
Dental Hygiene	50	26	41	20.35	38	59	34.18	914
X-Ray Technology	32	25	42	24.52	34	57	60.97	1343

TABLE 15 - Continued

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses: Number of Credit Hrs. in the Curriculum (3)	General Courses: Percent of Total Credit Hours (4)	General Courses: Aver. Cost Per SCH (5)	Vocational Technical Courses: Number of Credit Hrs. in the Curriculum (6)	Vocational Technical Courses: Percent of Total Credit Hours (7)	Vocational Technical Courses: Aver. Cost Per SCH (8)	Annual Cost Per (FTE) Student (9)
Industrial Technical Occupations:								
Drafting Technology	78	29	46%	$23.62	34	54%	$63.91	$1429
Electronic Data Process.	160	28	44	22.79	36	56	60.61	1377
Machine Tool Technology	44	30	47	26.33	34	53	27.53	863
Technical Communication	43	34	56	29.12	27	44	40.48	1343
Technical Publications Specialist	20	32	51	23.91	31	49	38.71	983
Public Service:								
Police Administration	142	36	56	24.67	28	44	21.14	740

TABLE 16.--Credit Hours and Unit Costs by Type of Course and Curriculum, Institution H, 1964-65

Curriculum (1)	Number of Full-Time Students Enrolled (2)	General Courses			Vocational Technical Courses			Annual Cost Per (FTE) Student (9)
		Number of Credit Hrs. in the Curriculum (3)	Percent of Total Credit Hours (4)	Aver. Cost Per SCH (5)	Number of Credit Hrs. in the Curriculum (6)	Percent of Total Credit Hours (7)	Aver. Cost Per SCH (8)	
Liberal Arts and Transfer:	3535	64	100%	$27.34	0	0%	$-----	$ 875
Engineering Technologies:								
Electrical Technology	94	22	34	17.81	42	66	40.05	1003
Business and Office Occupations:	223							
Advertising		33	52	27.03	31	48	22.94	802
Accounting		22	35	22.64	40	65	28.75	816
Real Estate		26	42	16.38	36	58	11.25	416
Management		26	41	19.58	37	59	20.65	637
Secretarial (2 years)		15	24	16.53	47	76	37.98	1017
Secretarial (Legal and Medical)		30	24	13.37	94	76	37.83	990
Retailing		31	48	26.32	33	52	18.15	708
Industrial Technical Occupations:								
Drafting Technology	108	42	67	28.26	21	33	21.29	820
Electronic Data Process.	--	21	36	14.95	38	64	30.50	737
Technical Communications	--	29	45	16.93	35	55	49.51	1112

TABLE 16 - Continued

Curriculum (1)	Number of Full-Time Students Enrolled (2)	Number of Credit Hrs. in the Curriculum (3)	Percent of Total Credit Hours (4)	Aver. Cost Per SCH (5)	Number of Credit Hrs. in the Curriculum (6)	Percent of Total Credit Hours (7)	Aver. Cost Per SCH (8)	Annual Cost Per (FTE) Student (9)
Trades and Industrial Fields:								
Auto Body Mechanic	29	21	33%	$18.80	42	67%	$26.21	$ 748
Auto Body Repair	20	7	23	14.29	24	77	22.29	635
Heavy Equipment Mechanics	66	28	44	20.71	35	56	34.51	868
Industrial Supervision	--	36	58	29.03	26	42	16.58	738
Welding	--	14	45	47.29	17	55	27.12	1123

above standards, many of the curricula offered in these sample institutions are being operated with enrollments which are too low to attain a reasonable economy of scale. In some of these institutions the number of part-time students enrolled, but not shown in Tables 9 through 16, may be sufficient to overcome some of the diseconomies of small enrollments by full-time students.

Average cost per student credit hour in specialized vocational and technical courses (column 8) is the one variable that does seem to make the difference in the total cost of educating a student in a curriculum. As shown in column 8 of Tables 9 through 16 the average cost per student credit hour for specialized vocational and technical courses is usually much higher than the average cost per student credit hour for general courses. In Institution B the average cost per student credit hour for vocational and technical courses varies from a low of $24.85 in Police Administration to a high of $99.98 in Automotive Technology. More important than the fact that these average costs per student credit hour vary is the finding that they co-vary with the unit cost of educating a student in each of the vocational and technical curricula.

Inspection of the data in columns 8 and 9 of Tables 9 through 16 indicated that the variance in the unit cost of vocational and technical curricula might be due to the variance in the average cost per student credit hour for vocational and technical courses rather than the average cost per student credit hour for general courses. To test this hypothesis the Spearman Rank Correlation Coefficient (r_s) was calculated between average cost per student credit hour for specialized vocational and technical courses and the cost of educating a student for each of the vocational and technical curricula. The correlations are shown in Table 17 for the eight sample institutions. These correlations varied from a high of +1 in Institution B to a low of .77 in Institution G. All of the correlations are significant at the .01 level. This means that there is only one chance in 100 that values as large as these would have occured by chance alone. Therefore, we can reject the null hypothesis of no relationship and conclude that the average cost per student credit hour for specialized vocational and technical courses included in each curriculum is associated with the unit cost of educating a student in the curriculum. Since this is a part-whole relationship some correlation would be expected, but not so great a correlation as was found in this test.

This information does not identify the factors which specifically determine the differential cost of the curricula. The average cost per student credit hour is a function of the following four factors: (1) salaries paid instructors of classes included in the curriculum, (2) the teaching load of instructors in total contact hours, (3) class size, and (4) cost of supplies and other supportive services for teaching.

The next step, therefore, is to examine the salary structure in the sample institutions. Table 18 shows the data on average contract salaries paid full-time instructors in eight institutional areas in liberal arts and eight areas of vocational and technical courses in each sample

TABLE 17.--Correlation Between Average Cost Per Student Credit Hour in Specialized Vocational and Technical Courses and Annual Cost of Educating a Student in a Curriculum, Eight Sample Institutions 1964-65

Institution	Rank Order Correlation	Level of Significance
A	.96	.01
B	1.00	.01
C	.94	.01
D	.88	.01
E	.87	.01
F	.96	.01
G	.77	.01
H	.94	.01

TABLE 18.--Average Salaries Paid to Full-Time Instructors by Instructional Area, Eight Sample Institutions, 1964-65

Instructional Area	Institution							
	A	B	C	D	E	F	G	H
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Liberal Arts & General Education:								
Fine and Applied Arts	$8,257	$8,130	$-----	$-----	$8,830	$8,077	$9,548	$8,880
Communication and Literature	8,420	7,492	7,035	5,716	8,365	8,261	9,653	8,514
Social Science	7,889	8,638	7,035	6,350	8,330	8,696	9,303	9,246
Mathematics	8,994	8,344	8,134	5,745	8,476	8,652	9,930	9,163
Science	8,020	7,293	8,875	6,415	8,428	8,748	10,472	8,947
Physical Education	9,532	7,158	6,234	6,008	8,150	8,848	10,126	8,367
Average (Weighted)	8,221	7,800	7,636	6,170	8,406	8,534	9,689	8,826
Vocational and Technical:								
Engineering Technologies	9,172	8,054	8,111	7,772	8,161	9,159	10,227	9,767
Business & Office Occupations	9,105	8,176	7,362	6,422	7,849	8,902	9,971	8,642
Health & Medical Occupations	8,036	6,537	6,797	6,346	8,022	8,334	8,647	-----
Industrial Technical Occupations	9,394	-----	-----	7,622	8,824	8,194	-----	-----
Trades & Industrial Occupations	-----	-----	-----	-----	-----	-----	-----	8,537
Dietetics and Home Economics Occupations	-----	7,532	-----	-----	-----	7,543	10,050	8,400
Public Service Occupations	-----	-----	-----	-----	10,020	-----	10,350	-----
Average (Weighted)	8,913	7,864	7,608	7,273	8,202	8,795	9,749	8,711

institution. The over-all average salary for instructors in liberal arts and general education courses is compared to the over-all average salary for all vocational and technical courses. The data presented in Table 18 show that five of the eight institutions had higher over-all average salaries in vocational and technical courses than the average for liberal arts courses. In three of the eight institutions the average salaries are higher in liberal arts and general courses than in the vocational courses. Further analysis reveals that in six of the institutions the difference in average salaries for the two types of courses is less than $250. Therefore, there is no evidence in these data that the average salaries of instructors in vocational and technical areas are significantly higher than the average salaries in liberal arts and general courses.

A more detailed analysis of the averages by instructional area reveals that salaries for instructors in the engineering technologies are higher than the average for both liberal arts and vocational and technical salaries in seven of the eight schools. Average salaries for instructors in the health and medical occupations are generally lower than the over-all averages for the liberal arts and vocational and technical courses. However, these differences do not seem to be large enough to account for a very large percentage of the variance in the unit cost for each curriculum.

A further refinement in salary analysis should be introduced if an institution is interested in a continuous evaluation. This is a distinction between basic salary for beginning staff at the lowest rank and added factors of rank, experience, degree, and other characteristics. Average salaries are resultants of these factors. Unless they are taken into account an institution cannot assess either the true status or the trends by instructional areas.

The full-time teaching load of instructors measured in total contact hours is one of the factors which contributes to the higher cost per student credit hour for vocational and technical courses over liberal arts and general courses as shown in Tables 9 through 16. In many vocational and technical courses the student is required to be in class two hours for every hour of credit and in some special cases such as Nursing the ratio may be even higher. This factor alone would mean that the cost per student credit hour for this type of course is going to be approximately twice as high where the course is all laboratory type work.

Class size is an important factor which affects the cost per student credit hour. In many of the laboratory classes the class size is as low as ten or twelve students. In the advanced vocational and technical courses which have laboratory periods the class size is as low as 3 or 4 students in some schools. Even though there are only a few classes with enrollments that low, it does bring the average down and increase the cost per student credit hour. In a few of the general courses the class enrollments are as low as 2 or 3 students in the advanced laboratory classes, but the percent of all classes offered is not as great as in the vocational and technical courses.

The cost of supplies and services supportive to teaching affect the cost per student credit hour. The procedure used in this study to allocate these costs to departments and courses is too gross to allow an accurate analysis of the variance due to this factor.

Based on the observation of the investigator a combination of class size and number of contact hours per class account for a large percentage of the differential costs between liberal arts curricula and vocational and technical curricula. These two variables seem to be responsible for much of the variation in the unit costs of the different vocational and technical curricula.

CHAPTER V

PROJECTED DESIGN FOR A COST ANALYSIS

Chapter IV has presented data on some of the variables which affect the unit cost of the different curricula offered in comprehensive junior colleges. This chapter presents a proposed design for future studies of this type. The observations and experience gained from the present study provide a basis for proposing this design.

This study is limited in at least two major dimensions. The first limitation is that it does not include all of the costs for each curriculum. The costs for original equipment and capital outlay are not included in this study. The second major limitation is the method used to allocate or assign the supportive or indirect costs of the institutions to instructional departments and individual courses.

Limitations in time and staff made it impossible for the investigator to make a microanalysis of the financial and personnel records of the eight sample institutions which would be necessary to overcome the limitations outlined above. Many of the institutions do not keep the necessary records to make an accurate determination of the total cost of each course offered in the institution. The fact that they are not keeping the necessary records should not prevent these institutions and others from making slight changes and improvements in their record keeping procedure so that the institution or another external agency can conduct such analyses. As junior colleges become institutionalized, adequately financed, and coordinated by some state agency it is likely to be easier to justify the employment of sufficient staff members to perform this task.

General Design

A junior college cost study should be designed so that all of the costs of the institution can be allocated to the instructional departments and eventually to the individual courses in order that the unit cost of each can be calculated. If this is accomplished it is possible to determine the total cost of each department in the institution or use the unit cost figures for each course to calculate the cost of educating a student in each curricula offered. This projected design can be used by institutional personnel or other researchers who want to calculate the cost of educating a student in each curriculum offered.

Figure 1 illustrates the projected design for a cost analysis to determine the expenditure per full-time-equivalent student in a curriculum. It shows how each component of cost is allocated to the appropriate course and the unit cost of each course included in a curriculum is then cumulated to determine the cost of educating a student in that curriculum.

All of the expenditures of an institution are included under the components of cost. The components shown in Figure 1 are examples of budget items included in many junior college budgets. With this design other components could be utilized if they were more readily available.

FIGURE 1

Design for Cost Analysis (Expenditure Per FTE Student)

Components of Cost	Allocative Elements	Courses	$ Per FTE Student
1. Administration →	1. FTE Professional Staff	General:	
2. Instruction		→ Art	
		→ English	
a. Non-Teaching Salaries of Professional Staff →	2. a. FTE Professional Staff	→ Language	Liberal Arts
		→ Mathematics	→ 18-20 General Courses
b. Direct Salaries for Teaching →	b. Contact Hours	→ Music	
		→ Physical Education	
c. Other Instructional Costs →	c. Student Credit Hours Generated	→ Science	
		→ Social Science	
3. Operation of Plant →	3. Total Space-hours utilized by class	Vocational & Technical:	
		→ Aerospace	
4. Maintenance of Plant →	4. Total Space-hours utilized by class	→ Air-Conditioning	
		→ Applied Arts	Electronic Technology
		→ Automotive	
5. Auxiliary and Community Services →	5. Student Credit Hours Generated	→ Business	→ 4-8 General Courses and 12-16 Technical Courses
		→ Civil Engineering	
		→ Dental Assisting	
6. Equipment (Depreciation) →	6. Number of Course Sections in which equipment is used.	→ Dental Hygiene	
		→ Dietetics	
7. Capital Outlay	7. a. Total Space-hours utilized by Course	→ Drafting	→ Drafting
		→ Electronics.........	→ Electronics
a. Instructional →		→ Hotel Management	Elect. Circuits
b. Non-Instructional →	b. Assign to function served and then allocate to courses in same manner indicated above.	→ Metallurgy	Elect. Design
		→ Nursing	Automatic Controls
		→ Police Admin.	
		→ Transportation	
		→ Etc.	

The basis for allocating each component of cost to individual courses is shown under allocative elements. This method of differential allocation of the various components of cost to courses is specific and provides a rational basis for assigning indirect or supportive costs to a common instructional unit. Further study may reveal other allocative elements which can serve as a more accurate basis for distributing the components of cost.

General courses and vocational and technical courses are listed separately in this design in order to demonstrate the different combinations of courses included in the two sample curricula shown. The liberal arts curriculum consists of eighteen to twenty (100 percent) general courses which are usually less costly per student credit hour than the vocational technical courses. A technical curriculum such as Electronic Technology shown in Figure 1 is more expensive per full-time-equivalent student because twelve to sixteen (50 to 75 percent) of the courses included in that curriculum are the more expensive specialized technical courses and four to eight courses (25 to 50 percent) are the less costly general courses.

This design is flexible and can be readily adapted for use by any institution. Its use is not dependent upon any one type of accounting system or specific budget items. Other allocative elements can be substituted when research reveals their relationship to true cost. The use of this design is not contingent upon common courses or instructional departments in different institutions. Neither is it dependent upon the unit of credit utilized by a college. It allows comparisons between institutions using the semester credit hour and institutions utilizing the quarter hour as a unit of credit. It could be used to determine the cost per student by semester or quarter enrolled if such an analysis is desired.

The following specific steps should be followed in conducting a cost analysis for a junior college:

Step 1. Gather the following basic data:

A. Name of each professional staff member.

B. Position or duty assignment of each staff member. Staff with split assignments should have the amount of time spent in each area of work specified in full-time-equivalents.

C. The teaching load or schedule of each instructor for each semester, quarter, or teaching period within the time period covered. The fiscal year is the period for which financial records are most readily available. The teaching schedule for each instructor should show the course name, course number, section number, credit hour value, contact hours, full-time-equivalent staff time, building and room number where course meets, and enrollment for each section taught. Laboratory sections should be identified in order to prevent counting a student twice for the same course.

D. Financial reports which show the costs of instruction by instructional department. Institutions which do not have these records can establish a complete system of financial accounting which will make them readily available. This is no great task.

E. Financial reports which show the amounts expended for each function other than instruction. These items are administration, operation of plant, maintenance of plant, fixed charges, auxiliary or community services, and capital outlay.

F. A list of the name and number of each course offered by instructional department.

G. A document which lists the course name, course number, and credit hour value of each required and elective course included in each curriculum.

H. The number of full-time and part-time students enrolled in each curriculum during the period covered.

I. The number of graduates in each curriculum for the period covered.

J. An inventory of the equipment utilized in each department. The inventory should show the purchase price, date of purchase and estimated present value.

K. The original cost of each building on the campus and the cost and date of any additions or renovations.

L. The number of square feet of floor space in each classroom and laboratory.

M. The cubage of each classroom and laboratory.

Step 2. Analyze data to determine total salary cost for teaching each course, total student credit hour, and full-time-equivalent staff time.

A. Allocate the teaching salary of each professional staff member to each course he teaches on the basis of total contact hours. The full-time-equivalent staff time for each course should be determined in the same way. The salary cost, enrollment, and full-time-equivalent staff time should be summarized for each course on a form similar to Data Form III shown in Appendix D.

B. Calculate the total number of student credit hours generated in each course by summing the enrollments in all sections of the course and multiplying this total enrollment in each course by the credit hour value of the course.

C. Sum the full-time-equivalent staff time for each section of the course to arrive at the total full-time-equivalent staff time utilized by each course.

Step 3. Allocate the costs other than direct teaching salaries to courses on the basis specified below for each item:

A. Non-teaching salaries for deans, directors, department heads, and other professional staff assigned to instruction should be allocated to courses on the basis that the total number of full-time-equivalent staff for the course bears to the total full-time-equivalent teaching staff in the department.

B. Instructional costs for supplies, expendable equipment, non-professional salaries, and other instructional costs should be allocated to courses on the basis that the total student credit hours generated in a course bears to the total student credit hours in the department.

C. Administration Costs. The costs for administration should be allocated to instructional departments and courses on the basis that the total full-time-equivalent professional staff members in a course bears to the total full-time-equivalent in the department. This is based on the assumption that administration involves the supervision and direction of people who perform the tasks of instruction in the institution.

D. Costs for operation of plant. The square feet of floor space in the classroom or laboratory utilized by each class should be multiplied by the number of hours the class meets per week to arrive at a figure which represents the time and space used for each class. This figure could be called the space-hours utilized by each course. The total cost for operation of plant should be allocated to courses on the basis that the space-hours for the course bears to the total space-hours in the institution.

E. Costs for maintenance of plant. The total costs for maintenance of plant should be assigned to courses on the basis that the total space-hours for the course bears to the total space-hours utilized for teaching during the time period covered by the study.

F. Costs for auxiliary and community services. The total costs of these programs should be allocated to courses on the basis that the total student credit hours generated by each course bears to the total student credit hours produced by the institution. This is based on the assumption that a student uses and benefits from these services in proportion to the amount of course credit hours for which he is enrolled during the period.

G. Costs for equipment. The original cost of inventoried equipment for each department and for the total institution should be depreciated over a reasonable number of years and the annual cost assigned to the department and courses in which the equipment is used. If the equipment is used in more than one course the cost should be allocated to the courses on the basis which the number of sections of the course taught bears to the total sections taught in all the courses for which the equipment is used.

This is based on the assumption that the depreciation cost is the same for the equipment in a classroom or laboratory equipped for 30 students whether there are 30 students or 15 students enrolled in the class.

H. Capital outlay costs. The original cost of each building, including land and site development, should be depreciated over a reasonable number of years (30-40 years) and the annual cost of depreciation assigned to courses on the basis that the number of space-hours utilized by the course bears to the total space-hours generated in the building during the period studied. The depreciated cost of buildings not used predominantly for instruction should be distributed to the function which they serve (i.e. administration, operation, maintenance, auxiliary services) and then allocated to courses in the same manner described previously for that expenditure.

Step 4. Calculate the total cost per student credit hour for each course. Sum all of the costs allocated to each course including direct teaching costs and divide this amount by the total number of student credit hours generated in the course.

Step 5. Calculate the total cost of educating a student in each of the curricula outlined in the college catalog. This is accomplished by multiplying the credit hour value of each course included in a curriculum by its respective total cost per student credit hour and summing the products. This gives the total two year cost for a student in that curriculum. This can be converted to an average annual unit cost figure.

Step 6. Identify the variables which contribute to any variance in curricula cost which may be found.

A. Calculate average class size, number of contact hours in specialized courses, average salary for full-time instructors in each subject area, number of students enrolled in each curriculum, average class size in each subject area, average cost of supplies in specialized courses, average cost of equipment and capital outlay, in each curriculum, and other variables which may seem significant.

B. Calculate a Step-Wise Multiple Correlation to determine the variable or variables which make a significant contribution to the variance in curricula costs.

Data forms can be designed to implement this analysis with the use of computers. Some of the data such as square feet and cubic feet in each classroom and laboratory are fixed and would not require repeated entries by data collectors. Programs of analysis can be written and used repeatedly so that the analysis could be replicated year after year in the same institution or for similar data in several institutions. Some state boards of higher education have designed data forms and written programs which are now being used to compare the unit costs of courses in several colleges and universities within the state. If this can be accomplished in these institutions, there is no reason that it cannot be done for junior colleges. Such analyses conducted on an annual basis would identify trends and reveal the dynamic character of the respective variables.

CHAPTER VI

CONCLUSIONS AND IMPLICATIONS

Conclusions

The following conclusions are reached after a study of the differential costs of curricula in eight comprehensive junior colleges.

1. A majority of the vocational and technical curricula offered in comprehensive junior colleges cost more per student than liberal arts and transfer curricula in the same institution.
2. The Engineering Technology curricula cost on the average about two times as much per student to operate as the liberal arts or transfer curricula in the same institution.
3. Curricula in the Health and Medical Occupations cost about the same as in the Industrial Technical Occupations. Each of these cost approximately one and one-half times as much per student as liberal arts and transfer curricula in the same institution.
4. Curricula leading toward employment in Dietetics and Home Economics Occupations cost approximately 1.2 times as much per student as liberal arts and transfer curricula in the same institution.
5. Curricula leading toward employment in Business and Office Occupations and Public Service Occupations cost slightly less per student than liberal arts and transfer curricula in the same institution.

6. The specialized courses in the vocational and technical curricula are more expensive on a student credit hour basis than the courses in the general academic fields. In many curricula the specialized courses are at least four times as costly on a student credit hour basis as the general courses. In a very few of the least expensive business curricula the cost per student credit hour was less for specialized courses than for general courses.
7. A combination of small class enrollments and large number of class contact hours required in vocational and technical courses seems to be the factors which account for most of the increased cost of educating students in vocational and technical curricula when original equipment and capital outlay costs are excluded.

The findings of this study are sufficient to show that the next stage in cost analysis to determine the differential costs of junior college curricula is necessary. The conclusions of this study can be made more precise by data which institutions can now readily develop by use of the design suggested in this study. Items of cost such as capital outlay for building and equipment, teaching supplies, auxiliary services, and pupil personnel services, can be allocated with sufficient accuracy to courses and student credit hours if an institution desires this type of data. When this is done, propositions and hypotheses which will provide a basis for more specific and detail conclusions can be projected and tested. This type of research will rapidly improve the present state of knowledge about the cost of educating students in comprehensive junior colleges.

Educational planning will be facilitated. Trends of enrollments in various curricula will provide a basis for projecting costs. Then investments in education can be evaluated better than at present in relation to manpower needs in various fields.

Implications

Junior colleges in some states have accepted the challenge to become comprehensive institutions and provide two-year transfer curricula, vocational and technical curricula leading to employment upon completion of one or two years of organized study, and adult and continuing education. If these purposes are going to be consummated by junior colleges it is necessary that adequate financing be provided. The conclusions of this study should be instrumental in the provision of improved financial support tailored to the tasks to be performed by individual institutions.

Vocational and technical curricula cost more than transfer curricula. If it is important to a state or nation that these curricula be offered in adequate numbers, the agency in charge of recommending policies for financing junior colleges should consider some alternatives for distributing state and federal money in such a way that institutions can offer needed specialized vocational and technical curricula without withdrawing funds from the transfer curricula to supplement the more expensive specialized ones.

One alternative would be complete state support through a state system of junior colleges with budget approval by a state agency. In this way institutions offering more expensive programs would receive more funds and allocate them internally to the expensive curricula. Most states do not use this method of financing junior colleges, but they have some method of local-state sharing of the cost of junior colleges.

The local-state sharing method of supporting comprehensive junior colleges creates two major problems. The first problem is that the wealth which local junior college districts must tax to obtain their local revenue is usually not distributed in the same way as the students who attend junior colleges. This results in extreme differences in ability to raise local revenue, and therefore wealthy junior colleges may be able to raise with equal tax rates three or four times as much money per student locally as the poorer districts. This can result in extreme disparity in the amount of money expended per student in different institutions offering similar programs. The problem arises from the decision by most states to hold on to an old principle of financing public schools and try to transfer that principle to the financing of junior colleges.

The second problem is the differential cost of the various curricula in an institution. As shown in this study some curricula cost approximately twice as much per student as the liberal arts and transfer curricula in the same institution. When this is the case and state financial support is based on a flat amount per student credit hour or per full-time-equivalent student, it becomes necessary for the local district to supplement all of the burden of additional cost for the specialized curricula. Some local junior college districts where these specialized vocational and technical curricula are needed simply do not have sufficient wealth behind each student to support these more expensive programs without draining financial resources from the liberal arts and transfer curricula.

One of the ways to solve this problem would be for the state agency which controls junior colleges to conduct a cost analysis for each institution to determine the extra costs of each type of vocational and technical curricula offered in the state. The results of this study should then be used to develop a method of weighting students in junior colleges according to the type of curriculum in which they are enrolled. For example, full-time-equivalent students in the Engineering Technologies would be weighted 2.0, Health and Medical Occupations 1.5, Industrial Technical Occupations 1.5, Dietetics and Home Economics Occupations 1.2, Business and Office Occupations 1.0. A state aid program based on this approach would allow junior colleges with equal wealth per student and equal local tax effort to finance vocational and technical curricula for the same local cost per student as is required for the liberal arts and transfer programs. This assumes that the cost studies conducted to determine differential costs of curricula would include the cost of equipment and capital outlay that are not included in this study. It would also mean that an institution which offers several of the more expensive curricula would receive more state support per student than an institution which offers only liberal arts and transfer curricula plus a few of the less costly vocational and technical curricula. The weightings are just as useful in states which have complete state financing of junior colleges. The need for some method of evaluating the financial needs of an institution are just as crucial in a state financed system as when the local-state sharing method of finance is used.

This study suggests a basis for local junior colleges to project the cost of offering new vocational and technical curricula. Institutional personnel can describe the experiences which they desire for the students in a curriculum, project the cost of these experiences, and thus utilize the projected design described in this study to conduct a cost analysis to determine the estimated cost per student credit hour for each new course to be offered and the estimated unit cost of each new curriculum. Institutions can thus evaluate their expenditures in relation to measures of quality of program and student output.

The estimated unit costs for each curriculum could be used in a design similar to that utilized by Hirsch (6) to calculate benefit-cost ratios for students in various curricula. These ratios could be useful in decisions concerning allocation of resources to the different curricula in a single institution or in a state junior college system.

Administrative leaders can evaluate costs during the early periods of growth in various curricula in comparison with expectancies after reaching normal operating levels. Thus planning and management may be enhanced.

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APPENDIX A

Institutions in the Study

1. American River Junior College, Sacramento, California
2. Broome Technical Community College, Binghamton, New York
3. Flint Community Junior College, Flint, Michigan
4. Foothill College, Los Altos Hills, California
5. Henry Ford Community College, Dearborn, Michigan
6. Hudson Valley Community College, Troy, New York
7. Miami-Dade Junior College, Miami, Florida
8. St. Petersburg Junior College, St. Petersburg, Florida

APPENDIX B

Unit of Credit Used: Quarter_____ Semester_____

DATA FORM I

Name of Instructor or Other Professional Staff Member (1)	Total Annual Salary of Staff Member (2)	First Semester or Quarter					Second Semester or Quarter					Third Semester or Quarter				
		Course					Course					Course				
		Name (3)	No. (4)	Cr. Hrs. (5)	Enrollment (6)	Salary (7)	Name (8)	No. (9)	Cr. Hrs. (10)	Enrollment (11)	Salary (12)	Name (13)	No. (14)	Cr. Hrs. (15)	Enrollment (16)	Salary (17)

APPENDIX C

DATA FORM II

Line No.	Budget Category (1)	Total Indirect Expenses By Budget Category (2)	Allocation of Indirect Expenses to Instructional Departments							
			General Academic (3)	Life Sciences (4)	Mathematical Physical & Engineering Science (5)	Social Science (6)	Humanities (7)	Vocational Technical (8)	Professions (9)	Health, Phys. Ed. and Military (10)
1.	Administration									
2.	Instruction (Excluding instructional salaries listed in Data Form I)									
3.	Operation and Maintenance									
4.	Auxiliary Services									
5.	Fixed Charges									
6.	Other Operating Expenses									
7.	Total Operating Expenses Excluding instructional salaries listed in Data Form I. (Total Lines 1-6)									
8.	Total Instructional Salaries listed in Col. 3, Data Form I									
9.	Total Operating Expenditures for 1964-65. (Total Lines 7&8)									

APPENDIX D

DATA FORM III

JUNIOR COLLEGE CURRICULA COST STUDY

Institution B

Department Science and Mathematics

Division Mathematics

Course Name Intermediate Algebra

Course Number 115

Credit Hour Value 3

Direct Salary Cost/SCH $ 11.84

Indirect Cost/SCH $ (11.84 X 1.08) = 12.79

Total Cost/SCH $ (11.84 X 2.08) = 24.63

Section Number	Number of Students Enrolled	Direct Salary Cost	Section Number	Number of Students Enrolled	Direct Salary Cost
1	25	$424	16	24	$300
2	27	891	17	9	380
3	20	891	18	10	541
4	21	891	19		
5	16	891	20		
6	18	170	21		
7	27	591	22		
8	27	591	23		
9	17	780	24		
10	14	780	25		
11	14	611	26		
12	17	840	27		
13	17	840	28		
14	12	777	29		
15	22	777	30		

Total	337	$11,966
Total Indirect Cost		$12,923
Total Cost for Course		$24,889
Total Student Credit Hours		1011

APPENDIX E

Institution A

Automotive Technology Curriculum

Semester	Course Name and Number	Semester Hours	Cost Per Student
1	Automotive 10	3	$ 142
	Chemistry 10	4	104
	Machine Tools 10	3	65
	Mathematics 10	4	82
	Physical Education 31	1	33
	Sem. Total	15	$ 426
2	Automotive 11	3	138
	Automotive 12	2	100
	Drafting 10	3	104
	Mathematics 11	4	76
	Physics 10	4	72
	Physical Education 32	1	33
	Sem. Total	17	$ 523
3	Automotive 13	2	161
	Automotive 14	3	226
	Drafting 12	2	95
	English 10	3	64
	Physics 11	4	90
	Social Science 10	3	74
	Sem. Total	17	$ 710
4	Automotive 15	3	193
	Automotive 16	2	98
	English 11	3	73
	Hydraulics 10	2	89
	Industrial Material 10	3	107
	Social Science 11	3	46
	Sem. Total	16	$ 606
	Grand Total	65	$2265

Annual Cost Per Student $1,133